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Preliminary numerical simulation for shallow strata stability of coral reef in South China Sea

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Coral reefs are the geologic material and special rock and soil, which live in shallow water of the tropic ocean and are formed through biological and geological action. Since infrastructure construction is being increasingly developed on coral reefs during recent years, it is necessary to evaluate the shallow strata stability of coral reefs in the South China Sea. The paper is to study the borehole profiles for shallow strata of coral reefs in the South China Sea, especially in the hydrodynamic marine environment?, and to establish a geological model for numerical simulation with Geo-Studio software. Five drilling holes show a six-layer shallow structure of South China Sea, including filling layer, mid-coarse sand, coral sand gravel, fine sand, limestone debris and reef limestone. The shallow coral reef profile next to lagoon is similar to “layers cake”, in which the right side close to the sea is analogous to “block cake”. The simulation results show that coral reef stability depends on wave loads and earthquake strength, as well as the physical properties of coral reefs themselves. The safety factor of the outer reef is greater than 10.0 in the static condition, indicating that outer reefs are less affected by the wave and earthquake. However, the safety factor next to lagoon is ranging from 0.1 to 4.9. The main reason for the variations that the strata of coral reefs close to the sea are thick. For example, the thickness of reef limestone is more than 10 m and equivalent to the block. When the thickness of inside strata is less than 10 m, they show weak engineering geological characteristics. These findings can provide useful information for coral reef constructions in future.

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